UNITED STATES DEPARTMENT OF AGRICULTURE
AGRICULTURAL MARKETING ADMINISTRATION
DAIRY AND POULTRY LABORATORY

The following chemical procedures have been found by the A.M.A. laboratory to be simple, rapid, accurate and capable of precise duplication. The solids determination procedure does not require a vacuum chamber. Comparative studies on the methods and the Official A.O.A.C. show good agreement for all commercial purposes. Samples that do not meet the specification requirements with these modified methods are further tested in accordance with "Methods of Analysis" of the Association of Official Agricultural Chemists. No samples of egg powder are chemically rejected on the modified methods described below.

THE CHEMICAL ANALYSES OF DRIED EGGS

Total Solids

Accurately weigh 2 grams of a well mixed sample in a tared covered dish which had been previously dried at 103-105° C. and cooled in a desiccator. Loosen cover and transfer dish to a thermostatically controlled oven at 103-105° C. At the end of 1-1/2 hours tighten the cover, transfer dish to desiccator and weigh at room temperature. Calculate the loss in weight as percentage total solids.

Fat by Acid Hydrolysis

Transfer 1 gram (weighed accurately) of a well mixed dried egg sample into a fat extraction Mojonnier tube. Slowly add 10 ml. of dilute HCl washing down any egg particles that may be adhering to the side of the tube. The dilute HCl is prepared by adding 4 parts of concentrated HCl to 1 part of distilled water.

The extraction tube is set in a water bath of 70° C., the water then brought to a boil and boiling continued for 30 minutes; the tube must be carefully shaken at 5 minute intervals. Remove the tube from the water bath, add water to fill the lower bulb of the tube and then cool to room temperature.

To the treated sample in the extraction tube add 25 ml. of ethyl ether and mix by shaking. Next add 25 ml. of petroleum ether (b.p. 30-60° C.) and again mix by shaking. With a hand centrifuge, rotate the tube 60 turns in a time period of 1 minute. Decant the clear ether layer into a weighed aluminum dish and evaporate the ether slowly on a hot plate. Add distilled water to the Mojonnier tube to bring the water layer up to the top of the narrow stem and re-extract the liquid again using the same quantities of each ether and mixing after the addition of each. Centrifuge 60 times, decant the clear ether layer in the aluminum dish and evaporate slowly. The fat is dried at 100° C. in a vacuum oven for 5 minutes with the vacuum maintained at not less than 20 inches of mercury. Cool the sample to room temperature in a desiccator, weigh and report as percentage of fat.

Acidity of Ether Extract

Weigh about 2.0 grams of dried egg powder into a small 100 ml. extraction flask, add 30 ml. of ethyl ether and mix well. Decant the ether through a small filter paper into a weighed dish. The extraction is repeated using 30 ml. of ethyl ether. The ether is evaporated slowly on a hot plate and then the dish dried for 10 minutes in an atmospheric oven maintained at 100° C. Cool and weigh the dish. The extract is then dissolved in 30 ml. of acid-free carbon tetrachloride. The solution is titrated with approximately 0.05N sodium ethylate solution with phenolphthalein as the indicator. Report as ml. of 0.05N sodium ethylate per 1 gram of ether extract.

Preparation of Sodium Ethylate (0.05N)

Dissolve a piece of metallic sodium, about 1.1 grams, in 800 ml. of absolute alcohol. Titrate 10 ml. of 0.1N HCl with this solution and determine normality factor each day solution is used. For all practical purposes a satisfactory sodium ethylate solution is being prepared by the A.M.A. laboratory by adding metallic sodium to commercial 95% ethyl alcohol. Extra precaution is necessary because of the presence of water.

Procedure for Making Palatability Tests

Reconstitute 30 grams of dried egg powder as completely as possible with 90 grams of distilled water in a 250 to 400 ml. pyrex beaker. To do this, add 1/3 of the water, mix until smooth and add remainder of water slowly with stirring.

Place the beaker in gently boiling water and stir the egg while coagulation takes place. When coagulated to the consistency of scrambled eggs the sample is submitted for testing.

Three to six samples may be scrambled and tested at one time. To check on your accuracy, divide samples after coagulation and place on two plates instead of one. Number plates with a code. One (or two) known controls should preferably be included for comparison; for example, a "scramble" prepared as above from fresh egg pulp or a sample with an agreed score of 5 to 6.

The preparation of the samples and supervision of the test is carried out preferably by a person not on the tasting panel.

QUALITY SCORE FOR DRIED WHOLE EGG

(Sample tested in the form of scrambled egg, prepared by a standard method)

SCORE	DESCRIPTION OF QUALITY	
8 or higher	Comparable to fresh egg	Household Grades acceptable as scrambled egg
7	Barely detectable off-flavor	
6	Definite but not unpleasant off-flavor	
5	Unpleasant off-flavor	Commercial Grades suitable only for bakery and similar uses
4	Increasingly unpleasant off-flavor	
3	Strong unpleasant off-flavor	
2	Repulsive	Products unsuitable for Household or Commercial Uses
1-0	Increasingly repulsive	

Record any off-flavor encountered: Scorched, rancid, sour, fermented, musty, putrid, fishy, moldy or other abnormal off-odors.

A dried egg sample that is rancid, sour, fermented, musty, putrid, fishy, moldy or other abnormal off-odor and flavor is rejected by the laboratory.

Stuart's Method of Solubility

1.5 gms. of dried egg powder are added to 50 mls. of distilled water at 70-75° F. in a 50 ml. ground glass stoppered graduate. The contents of the graduate are shaken vigorously to obtain a uniform dispersion. The graduate is allowed to stand for 30 minutes at room temperature. The graduate is again shaken vigorously (approximately 50 times). The contents are then filtered through a fluted filter (Whatman #12 -- paper) and 5 mls. of the first 10 mls. of filtrate transferred, using a vol. pipette to a 15 ml. tapered centrifuge tube, graduated in 0.1 ml. subdivisions. 5 mls. of Na acetate buffer (pH 4.6) are added, followed by distilled water to bring water to a final vol. of 15 mls. Transfer the tube to a boiling water bath for 2 minutes. Cool the tube and centrifuge (2300 R.P.M. for a 16" diameter head) for a period of 10 minutes. The A.M.A. laboratory is obtaining an R.C.F. of 1193 for a 16" head and 2300 R.P.M. If a different sized centrifuge is employed, the same R.C.F. (or relative centrifugal force) may be obtained by the following formula:

$$RCF = 0.0000111\ N^2R$$

in which N is equal to the speed of rotation in revolutions per minute (R.P.M.) and R is equal to the radial distance of the mass from the center of rotation in centimeters. If this distance is measured in inches, it is necessary to convert to centimeters by using the factor 1 inch = 2.54 cm.

Read the volume of centrifuged sediment to the nearest 0.1 graduation and record this reading as the "solubility index". The pH of the sodium acetate buffer should be frequently checked.

By the method described the most soluble spray dried egg samples give a "solubility index" of 1.5 and the most insoluble an index of 0.1. Equivalent amounts of fresh whole egg mixtures (on a dry wt. basis) give an index of 1.7.